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LISTS OF SPECIES

Insular Anurans (Amphibia: Anura) of the coast of Rio de Janeiro, Southeast, Brazil

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ABSTRACT: Herein we present the first lists of anuran species of five islands off the coast of Rio de Janeiro State, Brazil, and updated lists for two other islands (Ilha Grande and Ilha da Marambaia). These lists resulted from thorough searches of the literature and of herpetological collections databases, and from surveys on the islands conducted between March 2009 and January 2011. Currently there are 49 species of anurans distributed in 10 families recorded for these islands and this number accounts for c. 90% of the diversity present in the nearby mainland areas. Although Hylidae represents more than 40% of the species recorded on the islands, *Thoropa miliaris* (Cycloramphidae) is the only species present on all islands. On the islands there are three endemic species and two species listed as threatened by the IUCN. This study has added seven species to the previous list for Ilha Grande and two species to the list for Ilha da Marambaia.

INTRODUCTION

The Atlantic Forest (AF) is one of the biodiversity hotspots for several groups of animals and plants (Myers *et al*. 2000). Throughout its range, from the State of Rio Grande do Sul in the south to the State of Piauí in the northeast of Brazil, this biome has about 480 species of amphibians (Becker *et al.* 2007). The State of Rio de Janeiro alone has more than 160 species of anurans (Rocha *et al*. 2004), 35 of which are endemic to the AF in the State. The anuran fauna of Rio de Janeiro has been studied for over a century and species lists are available for many continental localities (*e.g.*, Lutz 1954; Izecksohn and Carvalho-e-Silva 2001; Rocha *et al*. 2004; Carvalho-e-Silva *et al*. 2008; Salles *et al*. 2009; Siqueira *et al*. 2006; Silva-Soares *et al.* 2010; Vrcibradic *et al*. 2011). However, most of the well-surveyed localities are near the metropolitan area of the city of Rio de Janeiro. Elsewhere the State is poorly surveyed, and a list of the State's reptile and amphibian fauna has been compiled only recently (Rocha *et al*. 2004).

Comprehensive checklists are sources for biogeographic and ecological studies focused, for instance, on how communities were structured and how diversity levels are determined or regulated through time. Additionally, checklists of insular communities can guide the selection and sampling of species/populations for evolutionary studies evaluating the effects of geographic isolation and reduction/absence of gene flow.

Although Rio de Janeiro harbours hundreds of coastal land-bridge islands, formed as a result of sea level rise at the end of the last glacial period about ten thousand years ago (Suguio 1978), little has been published on the insular anuran fauna and species lists exist only for two islands, Ilha Grande (Rocha *et al*. 2009) and Ilha da Marambaia (Silva *et al*. 2008). These land-bridge islands represent the oldest-known fragmented habitats of AF, hence knowledge of their faunas may provide insights that are relevant to the conservation of biodiversity in continental fragments of this biome. For example, variation in size and structure of the habitats in these islands may influence the number of species each island can support.

Herein, we present the first lists of the anuran communities of five islands off the coast of Rio de Janeiro. We also update the lists for Ilha Grande and Ilha da Marambaia and provide comments on the relationship between island size and habitat structure and the number and ecological profile of the species documented.

MATERIALS AND METHODS

Study site

The State of Rio de Janeiro, southeastern region of Brazil, has a coastline extending for 635 km and hundreds of islands and islets off the coast varying in size and distance from the mainland. These islands were isolated after the Last Glacial Maximum when the sea level rose more than a hundred meters in approximately ten thousand years and flooded the coastal lowlands (Tessler and Goya 2005). Other events, such as tectonic movements, also contributed to the isolation process (Suguio *et al*. 2005). This study includes seven coastal islands (Figure 1 and Table 1) from three Municipalities of the State of Rio de Janeiro. Based on bathymetric charts and the geological information cited above, the estimated age of the islands range from seven to ten thousand years.

The AF in Rio de Janeiro has been reduced to 18% of its original distribution (Fundação SOS Mata Atlântica/INPE 2011) and the vegetation type covering the islands varies depending on their sizes. Small islands have secondary forest and terrestrial bromeliads fixed on rock outcrops. Medium and large islands have, in addition, Atlantic Ombrophilous Dense Forest. The climate is mainly hot and wet throughout the year with only three months (June, July and August) slightly cooler and drier (Salgado and Vasquez 2009). Table 1 shows the area, maximum altitude and minimum distance from mainland of each island. Permanent water bodies (*i.e*., ponds, streams and rivers) are found only on medium and large islands (Ilha Grande,

Ilha da Marambaia and Ilha de Itacuruçá), whilst small islands (Ilha de Jaguanum) have only temporary streams and ponds formed after heavy rains. The smallest islands (Ilha de Itanhangá and Ilha da Mãe) have only temporary ponds. Figure 2 shows some of the breeding habitats of anurans found on the islands.

During the period of colonization, these islands were used for many different purposes, such as coffee and sugar cultivation, prison, and quarantine for slaves (Mello 1987; Nóbrega 2004). Currently, most of these islands are occupied by touristic businesses and private properties. Ilha da Marambaia holds one of the bases of the Brazilian armed forces. Only three islands (Ilha Grande, Ilha da Gipóia and Ilha de Itanhangá.) are partially under official protection by *Área de Proteção Ambiental de Tamoios* (Inea - Decreto Estadual n° 20.172 1/94).

Data Collection

The species list were produced by combining (i) data available from the literature (Table 2) and herpetological collections databases, and (ii) visual encounter surveys conducted between March 2009 and January 2011. Additionally, in order to compare the insular and continental faunas we produced a list of the anuran species found on the mainland of the two Municipalities (Angra dos Reis and Mangaratiba) that include all the islands, with the exception of Ilha da Mãe. To produce this list we combined data available from herpetological collections databases and the list presented by Carvalho-e-Silva *et al*. (2008). Collected specimens were euthanized using a lethal dose of lidocaine, fixed in 10% formalin and now are preserved in 70% ethanol at the Coleção Herpetológica da Universidade Federal Rural do Rio de Janeiro (RU). The only specimen of *Trachycephalus mesophaeus* (Hensel, 1867) collected on Ilha de Itanhangá is missing from the collection (RU). Collection permits were issued by SISBIO/IBAMA (nº 21146/3, 09/11/2009, SISBIO/IBAMA (nº 10689-1, 2007) and Inea (035/2009). Vouchers are listed in Appendix 1. Taxonomy follows Frost (2013).

Results and Discussion

Forty-nine species of anurans were recorded in this study (Table 3). They are distributed in 10 families and 27 genera (Figures 3-5). Hylidae is the most speciose family representing more than 40% of the species; however no hylid was found on Ilha de Jaguanum. Among hylids, *Scinax* is the genus with most species (11) on the islands, five of them from the bromeliad dwelling *Scinax perpusillus* group. The cycloramphid *Thoropa miliaris* is the only species that occurs on all islands. Of the 27 genera present on the islands, nine (12 species) were found only on the largest island, Ilha Grande (*Bokermannohyla*, *Brachycephalus*, *Cycloramphus*, *Fritziana*, *Ischnocnema*, *Itapotihyla*, *Phasmahyla*, *Proceratophrys* and *Zachaenus*). *Leptodactylus marmoratus* occurs on all islands, except on Ilha da Mãe.

There are two endemic species described for Ilha Grande, *Hylodes fredi* (Canedo and Pombal 2007) and *Proceratophrys tupinamba* (Prado and Pombal 2008) and one for Ilha da Marambaia, *Leptodactylus marambaiae* (Silva *et al*. 2008). Four species of the *Scinax perpusillus* group collected on four different islands (see Table 3) are possibly new species and known only for these islands. One juvenile specimen of *Fritziana* sp. (MNRJ 76140) collected on Ilha Grande could not be identified to species level. This specimen probably belongs to one of the three species that occur in the region on the mainland: *F. fissilis* (MNRJ 2297, MNRJ 44551), *F. goeldii* (UNIRIO 358) and *F. ohausi* (see Carvalho-e-Silva *et al*. 2008). Only one individual of *Rhinella icterica* was recorded on Ilha Grande, based on a digital photograph (Figure 3C) taken outside of a house at Vila do Abraão (Suzana Vaz pers. com.).

We have added seven species to the list of Ilha Grande (*Fritziana* sp., *Hylodes asper*, *Phasmahyla guttata*, *Rhinella icterica*, *Scinax fuscovarius*, *Scinax* gr. *perpusillus* and *Vitreorana eurygnatha*) and two to the list of Ilha da Marambaia (*Scinax cuspidatus* and *Vitreorana uranoscopa*).

When compared to nearby localities in the mainland (*i.e.*, Angra dos Reis and Mangaratiba), the islands included

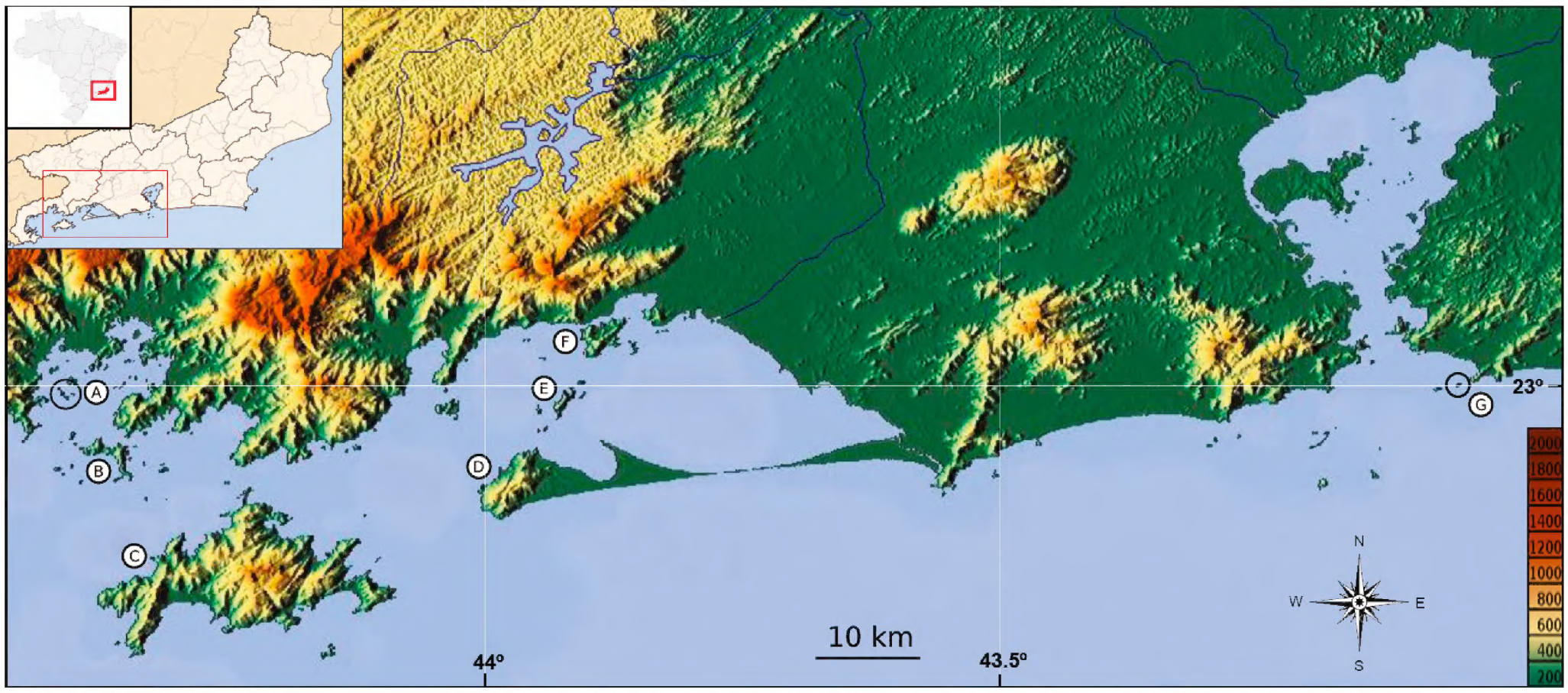

Figure 1. Map of the study area in the State of Rio de Janeiro, Brazil: (A) Ilha de Itanhangá; (B) Ilha da Gipóia; (C) Ilha Grande; (D) Ilha da Marambaia; (E) Ilha de Jaguanum; (F) Ilha de Itacuruçá; (G) Ilha da Mãe.

Table 1. List of islands from Rio de Janeiro State included in this study. Area (ha), Max Alt (m) = maximum altitude, Dist (km) = distance from mainland.

ISLAND	MUNICIPALITY	LATITUDE	LONGITUDE	AREA	MAX ALT	DIST
Grande	Angra dos Reis	23°08′33″ S	44°10′20″ W	19300.0	1031	3.0
Marambaia	Mangaratiba	23°04′23″ S	43°58′12″ W	4200.0	647	9.5
Itacuruçá	Mangaratiba	22°56′01″ S	43°53′00″ W	994.0	335	0.2
Gipóia	Angra dos Reis	23°02′33″ S	44°22′02″ W	603.3	286	0.7
Jaguanum	Mangaratiba	23°00′01″ S	43°55′44″ W	252.0	232	6.6
Itanhangá	Angra dos Reis	22°59′28″ S	44°24′42″ W	31.1	79	1.3
Mãe	Niterói	22°59′02″ S	43°03′57″ W	17.4	50	1.0

in this study hold *c.* 90% of their diversity. Hylidae is the most speciose family on islands. This result was expected because this family also contains more species in the continent in all the areas surveyed (Rocha *et al*. 2004; Carvalho-e-Silva *et al*. 2008; Salles *et al*. 2009). Given that the islands formation resulted from the isolation of coastal areas, it was expected that the islands faunas would represent subsets of those of the adjacent mainland.

One would expect that some of the species with more generalized reproductive mode (*sensu* Duellman and Trueb 1986) would be more widespread on islands. However, a surprising result of our surveys is that three species with specialized reproductive modes are common to most of the islands. In the case of *Thoropa miliaris*, its presence on all islands may be explained by the commonality of its breeding habitat. *Thoropa miliaris* lays eggs on films of water over rock surfaces, where tadpoles remain until the completion of metamorphosis. This microhabitat is widespread in the continent and on all islands included in this study. In addition, *T. miliaris* is known to tolerate salt water (Abe and Bicudo 1991) and to feed on small marine crustaceans (Sazima 1970). Another common species found on six of the seven surveyed islands is *Leptodactylus marmoratus*. This small leptodactylid lays eggs in foam nests deposited in subterranean chambers in the leaf-litter (Lutz 1947), which can be found virtually on every island (apart from Ilha da Mãe). Different species of the bromeliad dwelling frogs of the *Scinax perpusillus group (sensu* Peixoto 1987*)* are present on four of the studied islands. Species of this group also occur on islands off the coast of São Paulo State (Brasileiro *et al*. 2007a, b; Alves-Silva and Silva 2009), where Bell *et al*. (2012) founded molecular evidence of significant genetic differentiation between insular and mainland populations exclusively for *Scinax faivovichi*. The other two insular populations included on their study, from Mar Virado and Queimada Grande, were not genetically differentiated from mainland populations, even though the latter shows a considerable differentiation in call. Cases of amphibian genetic divergence on land-bridge islands have been attributed to genetic drift before the formation of the islands (Velo-Antón *et al.* 2011; Bell *et al*. 2012).

Of our list, only *Chiasmocleis carvalhoi*, which occurs on Ilha Grande, Ilha da Marambaia and Ilha de Itacuruçá, appears on the IUCN Red List as "Endangered" (Pimenta and Peixoto 2004). This species lives in the leaf litter of primary and secondary forests, where adults lay their eggs in temporary ponds formed after heavy rains. Although *C. carvalhoi* is considered under threat, this explosive breeder can be found in large numbers after heavy rains (Cruz *et al*. 1997; Carvalho-e-Silva *et al*. 2008). The fruit-eating *Xenohyla truncata* (Silva *et al*. 1989), found on Ilha da Marambaia, is currently listed by IUCN as "Near Threatened" given that its extent of occurrence is less than 20,000 km^2. This species, endemic to Rio de Janeiro State (Rocha *et al*. 2004), lives in restinga habitats using bromeliads as shelter during the day and reproduces in temporary ponds. *Xenohyla truncata* occurs on some scattered areas along the coast and the population of Ilha da Marambaia represents the southern limit of its distribution, whilst the northern limit is on the border with the State of Espírito Santo. The massive destruction of its habitat by speculative development is threatening this species.

Table 2. Database of the anurans diversity included in this study. HCD: herpetological collection database.

ISLAND	SOURCE	AUTHOR/YEAR
Grande	Book; HCD; Present study	Rocha *et al*. 2009
Marambaia	Article; HCD; Present study	Silva *et al*. 2008
Itacuruçá	HCD; Present study	
Gipóia	HCD; Present study	
Jaguanum	Present study	
Itanhangá	Present study	
Mãe	Present study	

Figure 2. Some of the breeding habitats used by anurans on the islands: (A) bromeliads; (B) temporary pond inside forest; (C) film of water over rock surfaces; (D) forest stream; (E) permanent pond in restinga; (F) temporary pond in restinga.

Table 3. List of species found on seven islands off the coast of the State of Rio de Janeiro, Brazil. Gr = Ilha Grande, Ma = Ilha da Marambaia, Ic = Ilha de Itacuruçá, Gp = Ilha da Gipóia, Jg = Ilha de Jaguanum, In = Ilha de Itanhangá, Me = Ilha da Mãe. (*) Species added to the previous list.

TAXON	GR	MA	IC	GP	JG	IN	ME
Brachycephalidae							
Brachycephalus didactylus (Izecksohn, 1971)	x						
Ischnocnema guentheri (Steindachner, 1864)	x						
Ischnocnema octavioi (Bokermann, 1965)	x						
Ischnocnema parva (Girard, 1853)	x						
Bufonidae							
Dendrophryniscus brevipollicatus Jiménez de la Espada, 1870	x	x				x	
Rhinella icterica (Spix, 1824)	*		x				
Rhinella ornata (Spix, 1824)	x	x	x				
Rhinella pygmaea (Myers and Carvalho, 1952)		x					
Centrolenidae							
Vitreorana eurygnatha (Lutz, 1925)	*	x					
Vitreorana uranoscopa (Müller, 1924)		*					
Craugastoridae							
Haddadus binotatus (Spix, 1824)	x	x	x		x		
Cycloramphidae							
Cycloramphus boraceiensis Heyer, 1983	x						
Cycloramphus fuliginosus Tschudi, 1838	x						
Proceratophrys tupinamba Prado and Pombal, 2008	x						
Thoropa miliaris (Spix, 1824)	x	x	x	x	x	x	x
Zachaenus parvulus (Girard, 1853)	x						
Hemiphractidae							
Fritziana sp.	x						
Hylidae							
Aparasphenodon brunoi Miranda-Ribeiro, 1920		x					
Aplastodiscus eugenioi (Carvalho-e-Silva and Carvalho-e-Silva, 2005)	x	x	x				
Bokermannohyla circumdata (Cope, 1871)	x						
Dendropsophus aff. *oliveirai*		x					
Dendropsophus decipiens (Lutz, 1925)		x					
Hypsiboas albomarginatus (Spix, 1824)	x	x	x	x		x	
Hypsiboas faber (Wied-Neuwied, 1821)	x		x				
Itapotihyla langsdorffii (Duméril and Bibron, 1841)	x						
Phasmahyla guttata (Lutz, 1924)	*						
Scinax alter (Lutz, 1973)		x					
Scinax cuspidatus (Lutz, 1925)		*					
Scinax fuscovarius (Lutz, 1925)	*						
Scinax gr. *perpusillus*	*						
Scinax gr. *perpusillus*			x				
Scinax gr. *perpusillus*						x	
Scinax gr. *perpusillus*		x					
Scinax hayii (Barbour, 1909)	x			x			
Scinax trapicheiroi (A. Lutz and B. Lutz, 1954)	x	x	x				
Scinax tupinamba Silva and Alves-Silva, 2008				x			
Scinax x-signatus (Spix, 1824)		x					
Trachycephalus mesophaeus (Hensel, 1867)				x			
Xenohyla truncata (Izecksohn, 1959)		x					
Hylodidae							
Crossodactylus gaudichaudii Duméril and Bibron, 1841	x	x					
Hylodes asper (Müller, 1924)	*						
Hylodes fredi Canedo and Pombal, 2007	x						
Hylodes phyllodes Heyer and Cocroft, 1986		x					
Leptodactylidae							
Leptodactylus latrans (Steffen, 1815)		x	x	x			
Leptodactylus marambaiae Izecksohn, 1976		x					
Leptodactylus marmoratus (Steindachner, 1867)	x	x	x	x	x	x	
Physalaemus signifer (Girard, 1853)	x	x					
Microhylidae							
Chiasmocleis carvalhoi Cruz, Caramaschi, and Izecksohn, 1997	x	x	x				
Myersiella microps (Duméril and Bibron, 1841)	x	x	x		x		
Species richness	**31**	**26**	**13**	**7**	**4**	**5**	**1**

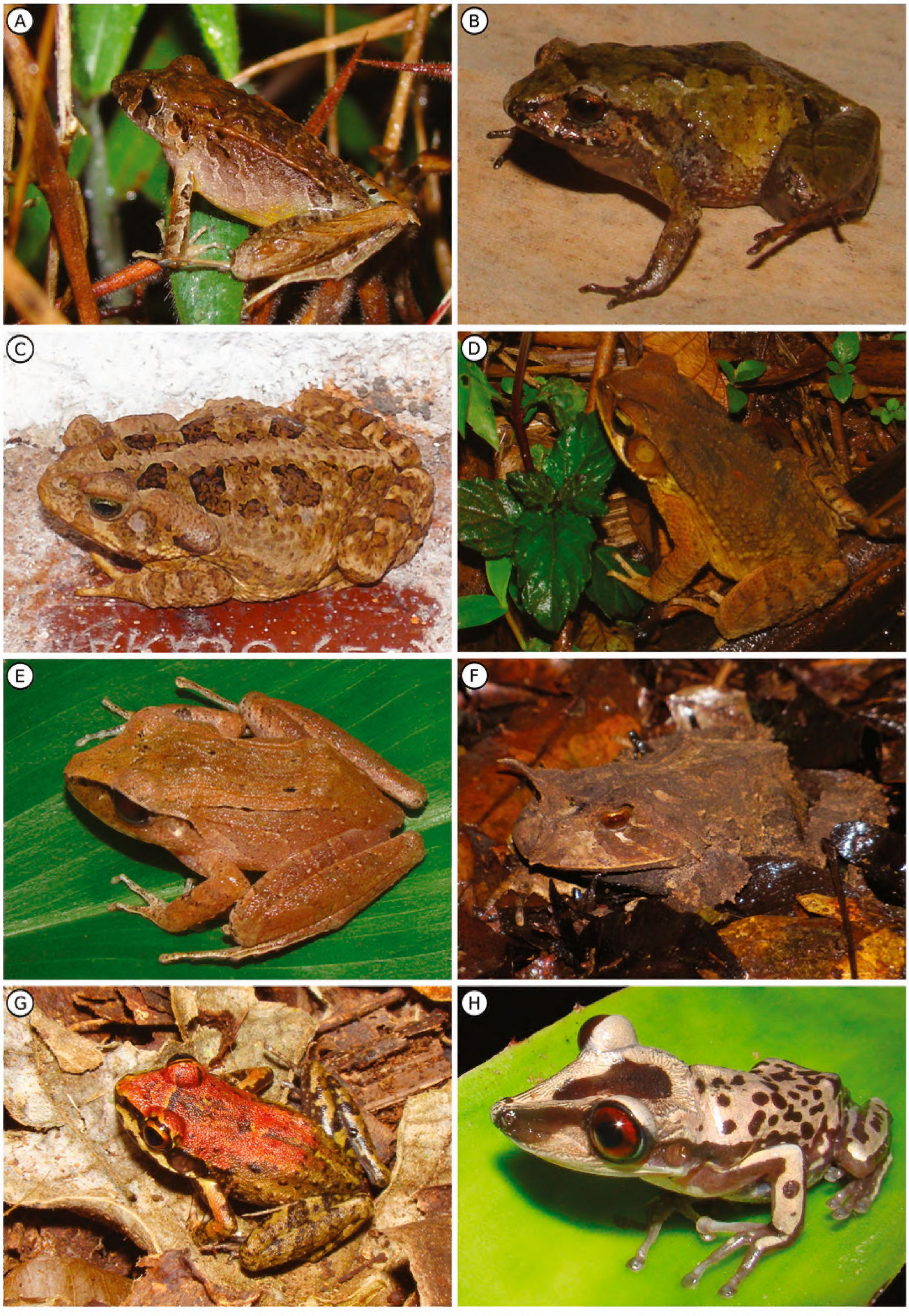

Figure 3. Anuran species found on the islands: (A) *Ischnocnema guentheri*; (B) *Ischnocnema parva*; (C) *Rhinella icterica*; (D) *Rhinella ornata*; (E) *Haddadus binotatus*; (F) *Proceratophrys tupinamba*; (G) *Thoropa miliaris*; (H) *Aparasphenodon brunoi*.

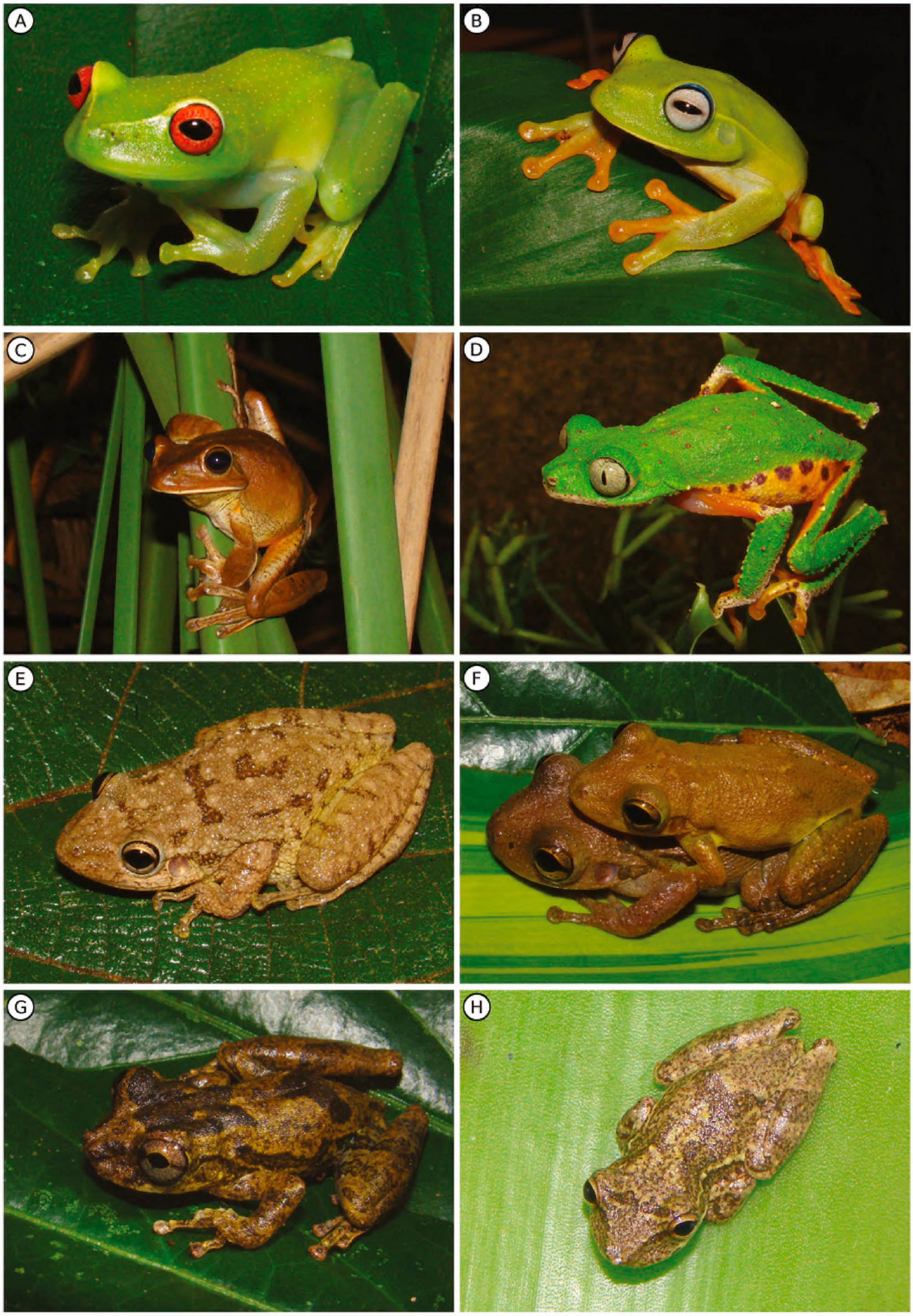

Figure 4. Anuran species found on the islands: (A) *Aplastodiscus eugenioi*; (B) *Hypsiboas albomarginatus*; (C) *Hypsiboas faber*; (D) *Phasmahyla guttata*; (E) *Scinax fuscovarius*; (F) *Scinax hayii*; (G) *Scinax trapicheiroi*; (H) *Scinax tupinamba*.

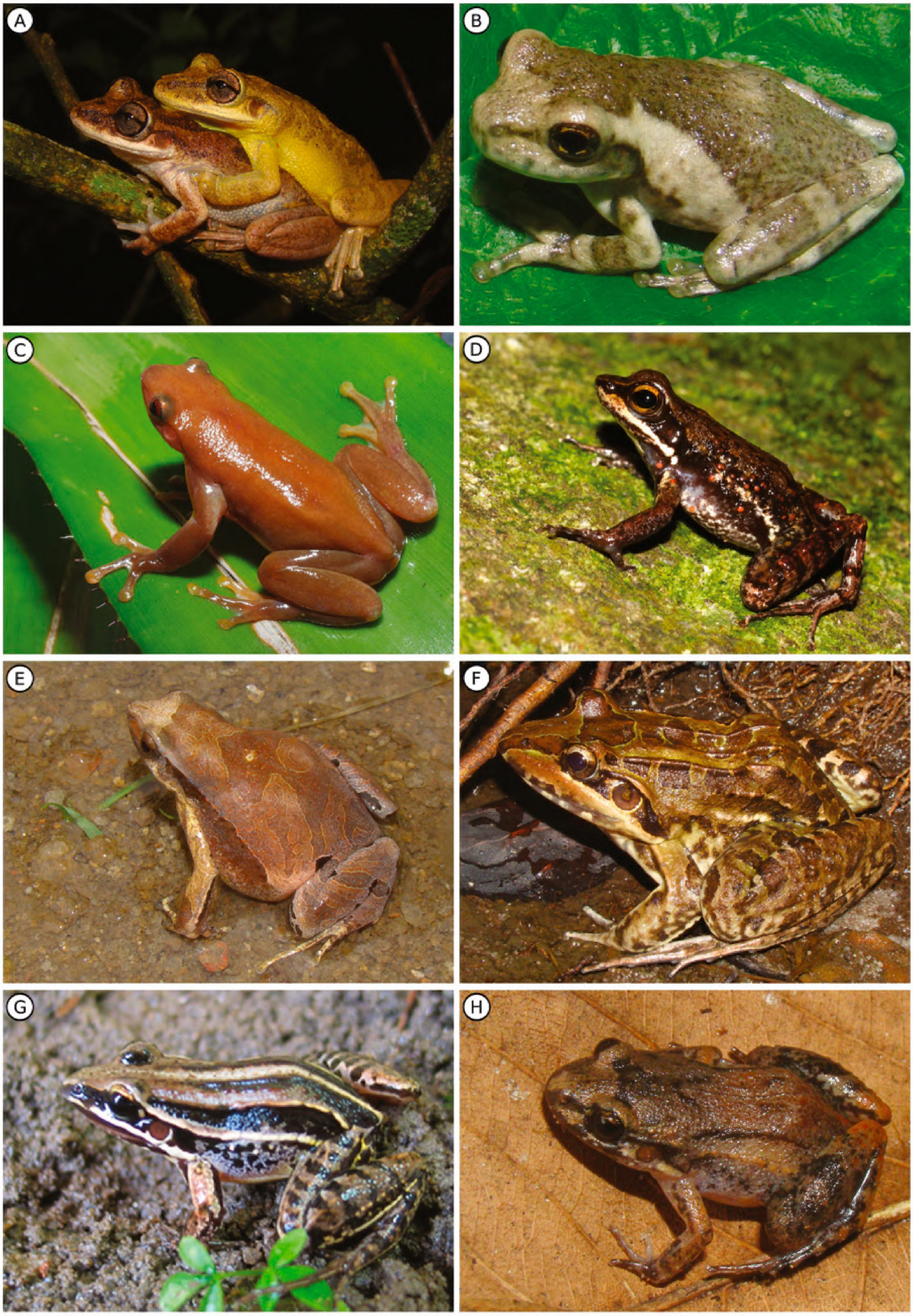

Figure 5. Anuran species found on the islands: (A) *Scinax x-signatus*; (B) *Trachycephalus mesophaeus*; (C) *Xenohyla truncata*; (D) *Hylodes fredi*; (E) *Physalaemus signifer*; (F) *Leptodactylus latrans*; (G) *Leptodactylus marambaiae*; (H) *Leptodactylus marmoratus*.

Amphibians have long being considered as poor dispersers across seawater barriers (Darwin 1859, p. 382) and their presence on islands is often related to vicariant events (Vences *et al*. 2003). However, there is evidence of some overseas dispersal (Hedges *et al*. 1992; Vences *et al*. 2003; Measey *et al*. 2007). Rafting, reduction in salinity of surface waters and favourable currents, acting separately or in synergy, are the most feasible paths to dispersal (Hedges *et al*. 1992; Kaiser *et al*. 1994; Measey *et al*. 2007). Translocation of species by humans also explains the presence of some amphibians on islands (see Vences *et al*. 2003, p. 2439; Toledo and Ribeiro 2009). *Rhinella icterica* is a common species in the mainland and occurs from sea level up to 1,200m, from forests to open areas, including highly disturbed habitats (Silvano *et al*. 2010). Because of its larger size, different colour pattern and more massive parotid glands, *R. icterica* can be easily distinguished from *R. ornata*, which also occurs on Ilha Grande. Given that many herpetologists have exhaustively surveyed this island, we consider the possibility that *R. icterica* has been overlooked as unlikely. We believe this is a case of dispersal, either by natural paths or human intervention. However, the presence of a single individual does not imply the establishment of the species on the island.

There are hundreds of islands off the southeastern coast of Brazil but for only three of them, one in São Paulo and two in Rio de Janeiro, had comprehensive lists of anuran species been published (Sawaya 1999; Centeno 2008; Silva *et al*. 2008; Cicchi *et al*. 2009; Rocha *et al*. 2009). Other islands have records published only about their endemic species (e.g., Brasileiro *et al*. 2007a, b). In this work we have added five species to the previous lists of Ilha Grande and Ilha da Marambaia, which leads us to believe that still more species could be found, especially on large islands. *Gastrotheca albolineata* (Lutz and Lutz 1939) is a large frog that is very difficult to sample because it lives and reproduces in the canopy (Izecksohn and Carvalho-e-Silva 2008). This species is present in Mangaratiba, which suggests that it may also be present on the islands. The same is true for other species with similar habits such as *Fritziana fissilis* (Miranda-Ribeiro 1920), *F. goeldii* (Boulenger 1895) and *F. ohausii* (Wandolleck 1907).

We hope that, in addition to practical use, this list may stimulate others to present data on insular communities, and encourage discussion of their conservation, evolution and ecology.

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Appendix 1. Voucher specimens.

Allobates olfersioides*:** RIO DE JANEIRO: *Angra dos Reis*: (MNRJ 5094); ***Aparasphenodon brunoi*:** RIO DE JANEIRO: *Mangaratiba*: Ilha da Marambaia (RU 62, RU 104, RU 143-44, RU 3419, RU 3531, RU 4867); ***Aplastodiscus arildae*:** RIO DE JANEIRO: *Mangaratiba*: (UNIRIO 1435); ***Aplastodiscus eugenioi*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 40513, MNRJ 48504, MNRJ 48502-03, MNRJ 62324-25, MNRJ 63936-37, RU 6998, RU 6999); *Mangaratiba*: (RU 4827); Ilha da Marambaia (RU 78, RU 159, RU 253, RU 3502, RU 3758, RU 4297, RU 5945, RU 5979-81, RU 6210, RU 6667-70, RU 6888-92, RU 6941, RU 6942, RU 6958, RU 6959); Ilha de Itacuruçá (RU 4972, RU 6655, RU 6779-82); ***Bokermannohyla circumdata*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 57161-64); *Mangaratiba*: (RU 1467, RU 1608); ***Brachycephalus didactylus*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 49292-99, MNRJ 55475, MNRJ 59361-62); *Mangaratiba*: (RU 1432, RU 1505); ***Brachycephalus ephippium*:** RIO DE JANEIRO: *Angra dos Reis*: (MNRJ 17457-58); *Mangaratiba*: (MNRJ 578, 2540, MNRJ 3073, MNRJ 11573-82, MNRJ 13261, MNRJ 13264-70, MNRJ 13272); ***Chiasmocleis carvalhoi*:** RIO DE JANEIRO: *Angra dos Reis*: (CFBH 5773); Ilha Grande (MNRJ 49303-06, MNRJ 49512-13, MNRJ 51827-55, MNRJ 59157, 59159); *Mangaratiba*: (UNIRIO 1034-37, UNIRIO 1476); Ilha da Marambaia (RU 201-02, RU 3501, RU 3608, RU 3652-53, RU 3741, RU 3764, RU 4298, RU 4885-90, RU 4987-89, RU 5021-29, RU 5408-09, RU 6073-74); Ilha de Itacuruçá (RU 6069); ***Crossodactylus gaudichaudii*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 40604-06, MNRJ 41745-63, RU 486, RU 6996-97, RU 7008); *Mangaratiba*: Ilha da Marambaia (RU 204-05, RU 873, RU 1862-63); ***Cycloramphus boraceiensis*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 48118); ***Cycloramphus fuliginosus*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande [1]; *Mangaratiba*: (MNRio 1207, MNRio 1210-11); ***Dendrophryniscus brevipollicatus*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha de Itanhangá (RU 7590-94); Ilha Grande (MNRJ 48516-18, MNRJ 52723, MNRJ 57603-05, MNRJ 57799-800, MNRJ 58296-99, MNRJ 58303-05, MNRJ 64647); *Mangaratiba*: (RU 1396, RU 1524, RU 1565, RU 1610, RU 5547-48, RU 5691); Ilha da Marambaia (RU 94, RU 96); ***Dendropsophus anceps*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1811, RU 4828-29); ***Dendropsophus* aff. *oliveirai*:** RIO DE JANEIRO: *Mangaratiba*: Ilha da Marambaia (RU 48, RU 59, RU 267, RU 5799); ***Dendropsophus berthalutzae*:** RIO DE JANEIRO: *Angra dos Reis*: (MNRJ 37293-94, MNRJ 39207); *Mangaratiba*: (RU 1406, RU 1442, RU 1448, RU 1636, RU 6177-78); ***Dendropsophus bipunctatus*:** RIO DE JANEIRO: *Angra dos Reis*: (MNRJ 37295-97); *Mangaratiba*: (RU 1800-07); ***Dendropsophus decipiens*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1822, RU 2046-49, RU 5550); Ilha da Marambaia (RU 1327, RU 4872); ***Dendropsophus elegans*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 6190); *Mangaratiba*: (RU 1808-10, RU 1472); ***Dendropsophus giesleri*:** RIO DE JANEIRO: *Mangaratiba*: (UNIRIO 451); ***Dendropsophus minutus*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1812-16, RU 5992-96, RU 6173-75); ***Dendropsophus seniculus*:** RIO DE JANEIRO: *Angra dos Reis*: (CFBH 5761); *Mangaratiba*: (UNIRIO 2545); ***Fritziana fissilis*:** RIO DE JANEIRO: *Mangaratiba*: (MNRJ 2297, MNRJ 44551); ***Fritziana goeldii*:** RIO DE JANEIRO: *Mangaratiba*: (UNIRIO 358); ***Fritziana* sp.:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 76140); ***Gastrotheca albolineata*:** RIO DE JANEIRO: *Mangaratiba*: (UNIRIO 2852); ***Haddadus binotatus*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 47971, MNRJ 48115-16, MNRJ 48508, MNRJ 48521-23, MNRJ 51815, MNRJ 51856, MNRJ 51859-61, MNRJ 51918-20, MNRJ 51963, MNRJ 51973-75, RU 7013); *Mangaratiba*: (RU 1397, 1423, 1430, 1434, 1459-60, 1468-69, 1483-84, 1488, 1517, 1536-39, 1555-56, 1584, 1594, 1629-30, 2233, 2430, 2464, 3616, 3912, 5987, RU 5549, 5690); Ilha da Marambaia (RU 26, RU 37, RU 58, RU 61, RU 71, RU 76, RU 77, RU 123, RU 184, RU 264, RU 265, RU 868-71, RU 1318, RU 1753, RU 2698, RU 3503, RU 3504, RU 3607, RU 3620, RU 3649, RU 3651, RU 3671, RU 3681, RU 3767-70, RU 3875, RU 3894, RU 4293-94, RU 4876-78, RU 4895-96, RU 5217-18, RU 5406, RU 5929, RU 5930, RU 5944, RU 5977, RU 5978, RU 6945, RU 7177); Ilha de Itacuruçá (RU 3487, RU 3577, RU 3617, RU 3618, RU 3887, RU 5959, RU 5973, RU 6018, RU 6021, RU 6070, RU 6282, RU 6286); Ilha de Jaguanum (RU 3314, RU 3316, RU 3329); ***Hylodes asper: RIO DE JANEIRO: *Angra dos Reis*: (RU 6205-06, RU 3940-45); Ilha Grande (RU 6995); *Mangaratiba*: (RU 3448-51, RU 3933); ***Hylodes fredi*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 35191-222, 35244-62, 36077, 38936, 51518-20, 62405, 64639, RU 6990); ***Hylodes phyllodes*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1658, 3932, 5325, 5326); Ilha da Marambaia (RU 206-10, 1751, 2454); ***Hypsiboas albomarginatus*:** RIO DE JANEIRO: *Angra dos Reis*: (CFBH 5772, RU 6196-98); Ilha da Gipóia (RU 7549-51); Ilha de Itanhangá (RU 7563-79); Ilha Grande (MNRJ 48512-13, 60991, 63934-35, RU 5222, 5243); *Mangaratiba*: (RU 1424, RU 1628, RU 1797-99, RU 1819, RU 1526); Ilha da Marambaia (RU 68, RU 101, RU 115-18, RU 170-82, RU 187-90, RU 472, RU 1326, RU 1368, RU 3759, RU 4863, RU 4883, RU 5286-87, RU 6943); Ilha de Itacuruçá (RU 3893, 4961-66); ***Hypsiboas faber*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 7072); Ilha Grande (MNRJ 48114); Bracuí (RU 7072); *Mangaratiba*: (RU 1481-82, RU 1523, RU 1567, RU 5688-89); Ilha de Itacuruçá (RU 3582, RU 3624, RU 4956-60, RU 6657, RU 6778); ***Ischnocnema guentheri*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 3936); Ilha Grande (MNRJ 47953, MNRJ 47969-70, MNRJ 47972-74, MNRJ 57085-89, MNRJ 61603-06, MNRJ 62327, MNRJ 62329); ***Ischnocnema octavioi*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 60158); ***Ischnocnema parva*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 49134, MNRJ 51814, MNRJ 59359-60, MNRJ 64673, MNRJ 66158, RU 7018); *Mangaratiba*: (RU 1314, RU 1463-65, RU 1473, RU 1478, RU 1486, RU 1513, RU 1515-16, RU 1542, RU 1552-53, RU 1593, RU 1621, RU 2041, RU 2043-44, RU 2093-94, RU 4832, RU 5312-16); ***Itapotihyla langsdorffii*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 48119, MNRJ 48511, MNRJ 51571-72, MNRJ 58061-62, RU 3496, RU 5221); *Mangaratiba*: (RU 1823); ***Leptodactylus latrans*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 6191); Ilha

[1] Cited by Rocha *et al.* 2009.

da Gipóia (RU 7069-70); *Mangaratiba*: (RU 1466, RU 1644, RU 1325, RU 5323-24); Ilha da Marambaia (RU 131-34, RU 138, RU 140-41, RU 155-58, RU 192- 200, RU 350, RU 471, RU 1322, RU 3881, RU 4864, RU 7206); Ilha de Itacuruçá (RU 3576); RPPN Rio das Pedras (RU 5323-24); ***Leptodactylus marambaiae*:** RIO DE JANEIRO: *Mangaratiba*: Ilha da Marambaia (RU 69, RU 119-22, RU 3535, RU 3569); ***Leptodactylus marmoratus*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha da Gipóia (RU 7056-64); Ilha de Itanhangá (RU 7595-96); Ilha Grande (MNRJ 42363, MNRJ 42364-81, MNRJ 44626, MNRJ 45791, MNRJ 51865, MNRJ 55735, MNRJ 66242, RU 7019); *Mangaratiba*: (RU 1427-28, RU 1433, RU 1452-58, RU 1471, RU 1476-77, RU 1485, RU 1487, RU 1506-09, RU 1511-12, RU 1530-34, RU 1547-51, RU 1585-88, RU 1595-96, RU 1606, RU 1622, RU 1631-32, RU 1650-54, RU 3915-22, RU 4830-31, RU 6179, RU 5605); Ilha da Marambaia (RU 97, RU 99, RU 102, RU 255, RU 259, RU 384-85, RU 5019, RU 5407); Ilha de Itacuruçá (RU 3579, RU 5960-61, RU 5974, RU 6024-35, RU 6215, RU 6290); Ilha de Jaguanum (RU 3313, RU 3320-21, RU 3326, RU 3353-58, RU 3362-65, RU 3372); ***Leptodactylus spixi*:** RIO DE JANEIRO: *Mangaratiba*: (RU 2052, RU 6209, UNIRIO 1045); ***Myersiella microps*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 44623, MNRJ 47967-68, MNRJ 51816-22, MNRJ 59357-58); *Mangaratiba*: Ilha da Marambaia (RU 3682, RU 5292); Ilha de Itacuruçá (MNRJ 52475); Ilha de Jaguanum (RU 3330-31, RU 3352); ***Phasmahyla cruzi*:** RIO DE JANEIRO: *Mangaratiba*: (UNIRIO 40, UNIRIO 68, UNIRIO 899, UNIRIO 908, UNIRIO 1118-19, UNIRIO 2234-35); ***Phasmahyla guttata*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 2217, MNRJ 53769-70); ***Phyllomedusa burmeisteri*:** RIO DE JANEIRO: *Mangaratiba*: (RU 5211, UNIRIO 2072, UNIRIO 2560); ***Physalaemus angrensis*:** RIO DE JANEIRO: *Angra dos Reis*: (MNRJ 35064-66); ***Physalaemus signifer*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 6193-95); Ilha Grande (MNRJ 49129-33, MNRJ 55734, MNRJ 64649, RU 7000-02); *Mangaratiba*: Ilha da Marambaia (RU 872, RU 1323, RU 1861, RU 3876, RU 4884, RU 4897, RU 5020, RU 5216, RU 5289, RU 6207); ***Proceratophrys appendiculata*:** RIO DE JANEIRO: *Angra dos Reis*: (MNRJ 2000); *Mangaratiba*: (RU 1435-36, RU 1438, RU 1543, RU 1561, RU 1592, RU 1647-48, RU 2045, RU 2050, RU 2431, RU 2465, RU 3913, RU 6170); ***Proceratophrys tupinamba*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 25101-17, MNRJ 38938, MNRJ 40715-16, MNRJ 54541, MNRJ 57245); ***Rhinella icterica*:** RIO DE JANEIRO: *Angra dos Reis:* Ilha Grande (Figure 3C); *Mangaratiba*: (RU 1504, RU 1642); Ilha de Itacuruçá (RU 4983, RU 5971-72); ***Rhinella ornata*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 6200-01, RU 6187, RU 7071, RU 7073-74); Ilha Grande (MNRJ 55661-62, MNRJ 56170, MNRJ 64650, RU 6971, RU 6974, RU 6975); *Mangaratiba*: (RU 1560, RU 1575-77, RU 1579, RU 1626, RU 5986); Ilha da Marambaia (RU 72, RU 81, RU 100, RU 145, RU 160-69, RU 183, RU 467-70, RU 1736, RU 3644-46, RU 3737-39, RU 3760-62, RU 3874, RU 3882, RU 4837-61, RU 4880-82, RU 4891-94, RU 5030, RU 5212-15, RU 5267-76, RU 5928, RU 6816, RU 7078, RU 7175-76); Ilha de Itacuruçá (RU 4967-71, 5969, RU 6656); ***Rhinella pygmaea*:** RIO DE JANEIRO: *Mangaratiba*: Ilha da Marambaia (RU 70, RU 751-52, RU 1839, RU 7207); ***Scinax alter*:** RIO DE JANEIRO: *Mangaratiba*: Ilha da Marambaia (RU 27, RU 31-32, RU 44, RU 60, RU 82-86, RU 103, RU 105-14, RU 146-47, RU 254, RU 257-58, RU 351-54, RU 913, RU 1077-83, RU 1752, RU 3676, RU 3765, RU 4868-69); ***Scinax angrensis*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 6199); ***Scinax argyreornatus*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1817-18); ***Scinax cuspidatus*:** RIO DE JANEIRO: *Mangaratiba*: (RU 6176); Ilha da Marambaia (RU 4870-71); ***Scinax fuscovarius*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (DZSJRP 2342); *Mangaratiba*: (UNIRIO 155, UNIRIO 320, UNIRIO 388, UNIRIO 672, UNIRIO 648); ***Scinax gr. perpusillus*:** RIO DE JANEIRO: *Angra dos Reis:* Ilha de Itanhangá (RU 7557-62); Ilha Grande (RU 3742-51); *Mangaratiba*: Ilha da Marambaia (RU 6785, RU 6952); Ilha de Itacuruçá (RU 5998-99, RU 6000-6014); ***Scinax hayii*:** RIO DE JANEIRO: *Angra dos Reis*: (CFBH 5762); Ilha da Gipóia (RU 7065-68); Ilha Grande (MNRJ 40110, MNRJ 48514-15, MNRJ 51864, MNRJ 64159, RU 7009-12); *Mangaratiba*: (RU 1611); ***Scinax similis*:** RIO DE JANEIRO: *Mangaratiba*: (RU 6171-72); ***Scinax trapicheiroi*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 39202-03, MNRJ 47975, MNRJ 48117, MNRJ 51517, MNRJ 64157-58, RU 6208, RU 7014-16); *Mangaratiba*: (RU 1398-401, RU 1403-05, RU 1407, RU 1409-18, RU 1420-22, RU 1439-41, RU 1443-45, RU 1447, RU 1450-51, RU 1633-35, RU 1825, RU 5988-89, RU 1384, RU 1563-64, RU 1656-57); Ilha da Marambaia (RU 47, RU 51-56, RU 66, RU 75, RU 124-27, RU 149-51, RU 185-86, RU 203, RU 266, RU 1324, RU 1720, RU 1722, RU 1724-25, RU 3650, RU 4295, RU 4835, RU 4879, RU 5277-78, RU 6944); Ilha de Itacuruçá (RU 3572-75, RU 3892, RU 4974-82, RU 5966, RU 6023); ***Scinax tupinamba*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha da Gipóia (MNRJ 53558-62); *Mangaratiba*: (RU 5990-91); ***Scinax x-signatus*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 6192); *Mangaratiba*: Ilha da Marambaia (RU 29-30, RU 34, RU 43, RU 45, RU 142, RU 355, RU 2466, RU 3604, RU 4898); ***Stereocyclops parkeri*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1824, RU 2051, RU 3526-27, RU 4833); ***Thoropa miliaris*:** RIO DE JANEIRO: *Angra dos Reis*: (CFBH 5064); Ilha da Gipóia (RU 7053-54); Ilha de Itanhangá (RU 7580-89); Ilha Grande (MNRJ 45480-99, MNRJ 45519-31, MNRJ 48449-50, MNRJ 51762, MNRJ 51989, RU 485, RU 5432, RU 6976-89); *Mangaratiba*: (RU 1425, RU 1461-62, RU 1480, RU 1489-90, RU 1571, RU 1643, RU 1846, RU 474-75, RU 1544, RU 5423); Ilha da Marambaia (RU 39-42, RU 63-65, RU 67, RU 73-74, RU 79-80, RU 135-37, RU 139, RU 152-54, RU 260-62, RU 1319-21, RU 1737-41, RU 1743, RU 1754, RU 1796, RU 3605-06, RU 3883-84, RU 3895-96, RU 4899, RU 5918-27, RU 6887, RU 6938); Ilha de Itacuruçá (RU 3583, RU 4865, RU 4973, RU 5970, RU 6063-64, RU 6287, RU 6289); Ilha de Jaguanum (RU 3315, RU 3317-19, RU 3322-25, RU 3327-28, RU 3332-48, RU 3361, RU 3368-69); *Niterói*: Ilha da Mãe (RU 477-479); ***Trachycephalus mesophaeus*:** RIO DE JANEIRO: *Angra dos Reis*: (RU 3621, RU 3628, RU 3934, RU 5016, RU 6188, RU 7055); Ilha da Gipóia (RU 3869); *Mangaratiba*: (RU 1429, RU 1431, RU 1572-73, RU 4826); ***Vitreorana eurygnatha*:** RIO DE JANEIRO: *Angra dos Reis:* Ilha Grande (MNRJ 2201); *Mangaratiba*: Ilha da Marambaia (RU 46); ***Vitreorana uranoscopa*:** RIO DE JANEIRO: *Mangaratiba*: (RU 1527-29, RU 1566); Ilha da Marambaia (MNRJ 20020); ***Xenohyla truncata*:** RIO DE JANEIRO: *Rio de Janeiro:* Restinga da Marambaia (DZSJRP 706-07); *Mangaratiba*: Ilha da Marambaia (MNRJ 20031); ***Zachaenus parvulus*:** RIO DE JANEIRO: *Angra dos Reis*: Ilha Grande (MNRJ 49637-38, MNRJ 50226, MNRJ 59356, MNRJ 64644); *Mangaratiba*: (RU 2038, RU 2210, RU 3525, RU 3914).